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SPECIFICATION
FOR
APPROVAL

(◆) Preliminary Specification
( ) Final Specification

Title	37.0” WXGA TFT LCD

BUYER	
MODEL	

SUPPLIER	LG.Philips LCD Co., Ltd.
*MODEL	LC370WXE
SUFFIX	SAA1(RoHS Verified)

*When you obtain standard approval,
please use the above model name without suffix

APPROVED BY	SIGNATURE / DATE
/	
/	
/	

Please return 1 copy for your confirmation with your signature and comments.

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Record of Revisions

Revision No.	Revision Date	Page	Description
0.0	Dec. 17, 2007	-	Preliminary Specification(First Draft)

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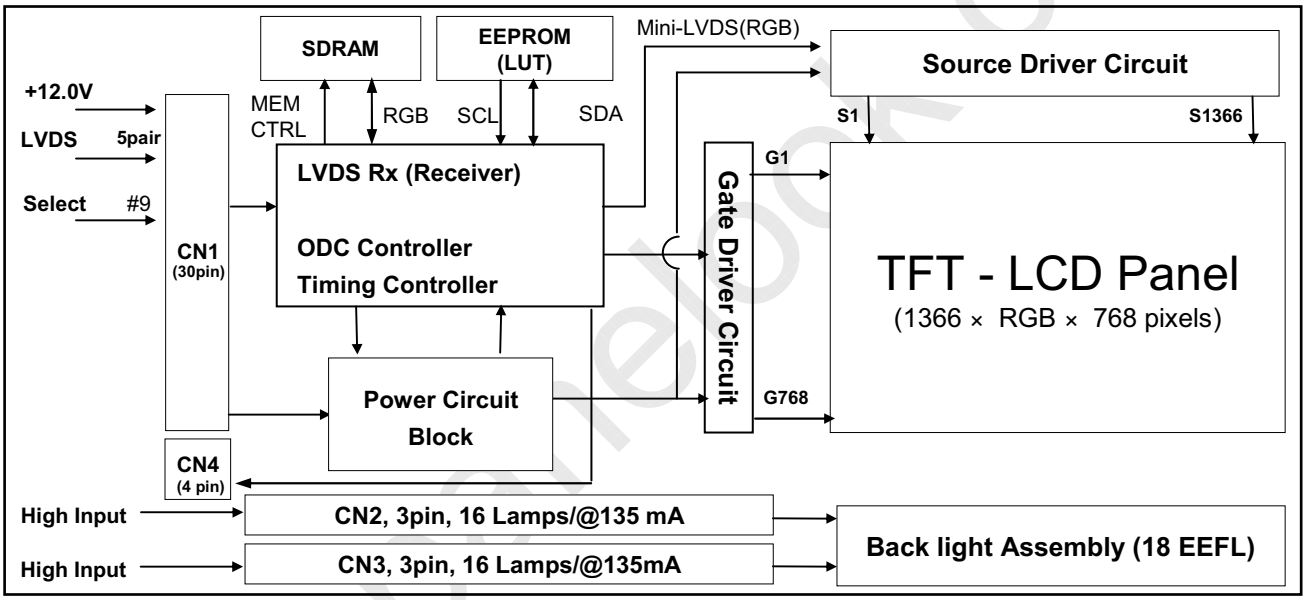
1. General Description

LC370WXE is a Color Active Matrix Liquid Crystal Display with an integral External Electrode Fluorescent Lamp(EEFL) backlight system. The matrix employs a-Si Thin Film Transistor as the active element. It is a transmissive type display operating in the normally black mode. It has a 37.02 inch diagonally measured active display area with WXGA resolution (768 vertical by 1366 horizontal pixel array) Each pixel is divided into Red, Green and Blue sub-pixels or dots which are arranged in vertical stripes. Gray scale or the luminance of the sub-pixel color is determined with a 8-bit gray scale signal for each dot, thus presenting a palette of more than 16.7M(true) colors.
It has been designed to apply the 8-bit 1 port LVDS interface.
It is intended to support LCD TV, PCTV where high brightness, super wide viewing angle, high color gamut, high color depth and fast response time are important.



General Features

Active Screen Size	37.02 inches(940.3mm) diagonal
Outline Dimension	877.0mm(H) x 516.8mm(V) x 46.9mm(D) (Typ.)
Pixel Pitch	0.200mm x 0.600mm x RGB
Pixel Format	1366 horiz. by 768 vert. pixels RGB stripe arrangement
Color Depth	8-bit, 16.7 M colors
Luminance, White	500 cd/m^2 (Center 1 point Typ.)
Viewing Angle (CR>10)	Viewing angle free (R/L 178(Typ.), U/D 178(Typ.))
Power Consumption	Total 123.9 Watt (Typ.) (Logic=3.9W, B/L=120 W @ with inverter,VBR-A=1.65V)
Weight	8,700g (Typ.)
Display Operating Mode	Transmissive mode, Normally black
Surface Treatment	Hard coating(3H), Anti-glare treatment of the front polarizer (Haze 13%)

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2. Absolute Maximum Ratings

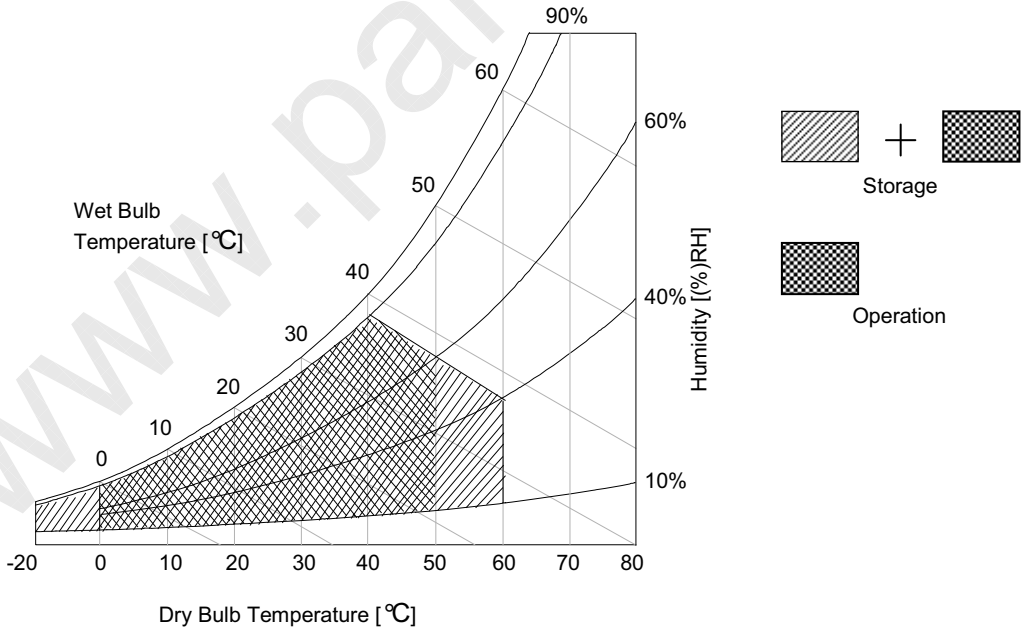
The followings are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Table 1. ABSOLUTE MAXIMUM RATINGS

Parameter		Symbol	Value		Unit	Remark
			Min	Max		
Power Input Voltage	LCD circuit	VLCD	-0.3	+14.0	V [DC]	at 25 ± 2 ℃
B/L Input voltage	Operating Voltage (one side)	VOP	700	1100	V[RMS]	at 25 ± 2 ℃ Burst Dimming Duty 100%
Operating Temperature		TOP	0	+50	℃	Note 1
Storage Temperature		TST	-20	+60	℃	
Operating Ambient Humidity		HOP	10	90	%RH	
Storage Humidity		HST	10	90	%RH	

Note :

1. Temperature and relative humidity range are shown in the figure below.
   Wet bulb temperature should be 39 ℃ Max. and no condensation of water.
2. Gravity mura can be guaranteed under 40℃ condition.



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3. Electrical Specifications

3-1. Electrical Characteristics

It requires two power inputs. One is employed to power the LCD electronics and to drive the TFT array and liquid crystal. The other input power for the EEFL/Backlight is to power inverter.

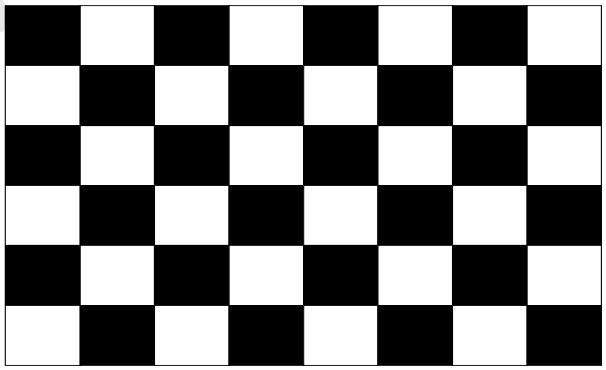
Table 2. ELECTRICAL CHARACTERISTICS

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
MODULE :							
Power Input Voltage		VLCD	11.4	12.0	12.6	VDC	
Option Input Voltage	High threshold	VIH	2.3	-	3.3	VDC	Page 9 #9 Pin
	Low threshold	VIL	0	-	0.7	VDC	
Power Input Current		ILCD	-	326	424	mA	1
			-	420	559	mA	2
Power Consumption		PLCD	-	3.9	5.1	Watt	Mosaic Pattern
		PLCD	-	5.04	6.7	Watt	Full White Pattern
Rush current		IRUSH	-	-	3.5	A	3

Note :

1. The specified current and power consumption are under the V_{LCD}=12.0V, 25 ± 2℃, f_V=60Hz condition whereas mosaic pattern(8 x 6) is displayed and f_V is the frame frequency.
2. The current is specified at the maximum current pattern[Full white pattern].
3. The duration of rush current is about 2ms and rising time of power Input is 0.5ms(min.).

White : 255Gray
Black : 0Gray



Mosaic Pattern(8 x 6)

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Table 3. ELECTRICAL CHARACTERISTICS for IPB & Lamp (Continue)

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Backlight Assembly for IPB :							
Operating Voltage (one side)		V_{BL}	800	950	1100	V_{RMS}	1, 2
Operating Current (one side)		I_{BL}	108	116	124	mA_{RMS}	1
Established Starting Voltage (one side)	0℃	V_S	-	-	1125	V_{RMS}	1, 3
	25℃		-	-	950		
Operating Frequency		f_{BL}	60	62	64	kHz	4
Striking Time		S_{TIME}	-	-	1.5	sec	3
Power Consumption		P_{BL}	-	120	-	Watt	6
Burst Dimming Duty		PWM duty	20		100	%	9
Burst Dimming Frequency		1/T	95	-	185	Hz	9

Parameter		Symbol	Values			Unit	Notes
			Min	Typ	Max		
Lamp :							
Lamp Voltage (one side)		V_{LAMP}	850	1040	1100	V_{RMS}	1, 2
Lamp Current (one side)		I_{LAMP}	3	7.25	8	mA_{RMS}	1
Discharge Stabilization Time		T_S	-	-	3	Min	1, 5
Lamp Frequency		f_{LAMP}	40	65	80	KHz	
Lamp Temperature		T_{LAMP}			130	℃	
Established Starting Voltage (one side)	0℃	V_S			1125	V_{RMS}	1, 3
	25℃				950		
Life Time			50,000			Hrs	7

Note : The design of the inverter must have specifications for the lamp in LCD Assembly.
The electrical characteristics of inverter are based on High-High Driving type.
The performance of the lamps in LCM, for example life time or brightness, is extremely influenced by the characteristics of the DC-AC inverter. So, all the parameters of an inverter should be carefully designed so as not to produce too much leakage current from high-voltage output of the inverter.
When you design or order the inverter, please make sure unwanted lighting caused by the mismatch of the lamp and the inverter (no lighting, flicker, etc) has never been occurred. When you confirm it, the LCD– Assembly should be operated in the same condition as installed in your instrument.

※ Do not attach a conductive tape to lamp connecting wire.
If you attach conductive tape to the lamp wire, not only luminance level can be lower than typical one but also inverter operate abnormally on account of leakage current which is generated between lamp wire and conductive tape.

1. Specified values are defined for a Backlight Assembly.(IBL : 16 lamp, 7.25mA/Lamp)
2. Operating voltage is measured at 25 ± 2℃(after 2hr.aging). The variance range for operating voltage is ± 10%.
3. The established starting voltage [V_S] should be applied to the lamps for more than Striking time (S_{TIME}) for start-up. Inverter open voltage must be more than established starting voltage. Otherwise, the lamps may not be turned on. The used lamp current is typical value.

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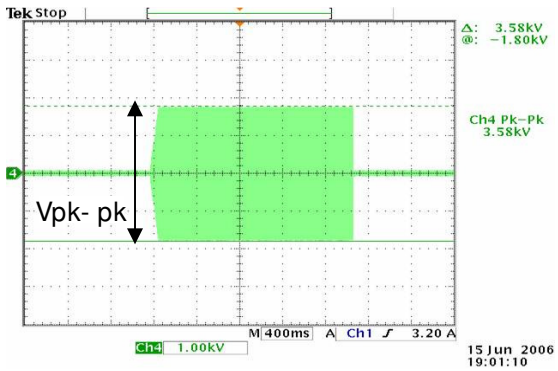
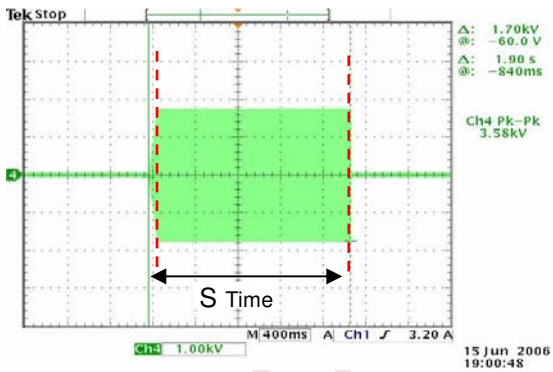
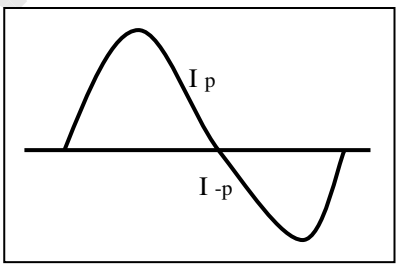




Vs = (Vpk-pk) / [2*root(2)]

4. Lamp frequency may produce interference with horizontal synchronous frequency and as a result this may cause beat on the display. Therefore, lamp frequency shall be as away possible from the horizontal synchronous frequency and its harmonics range in order to prevent interference.
5. The brightness of the lamp after lighted for 5minutes is defined as 100%.
   T_S is the time required for the brightness of the center of the lamp to be not less than 95% at typical current.
   The screen of LCD module may be partially dark by the time the brightness of lamp is stable after turn on.
6. Maximum level of power consumption is measured at initial turn on.
   Typical level of power consumption is measured after 2hrs aging at 25 ± 2℃.
7. The life time is determined as the time at which brightness of the lamp is 50% compared to that of initial value at the typical lamp current on condition of continuous operating at 25 ± 2℃, based on duty 100%.
8. The output of the inverter must have symmetrical(negative and positive) voltage and current waveform (Unsymmetrical ratio is less than 10%). Please do not use the inverter which has not only unsymmetrical voltage and current but also spike wave.
   Requirements for a system inverter design, which is intended to achieve better display performance, power efficiency and more reliable lamp characteristics.
   It can help increase the lamp lifetime and reduce leakage current.
   a. The asymmetry rate of the inverter waveform should be less than 10%.
   b. The distortion rate of the waveform should be within √2 ±10%.
   * Inverter output waveform had better be more similar to ideal sine wave.



* Asymmetry rate:

$| I_p - I_{-p} | / I_{op} \times 100\%$

* Distortion rate

I_p (or I_{-p}) / I_{op}

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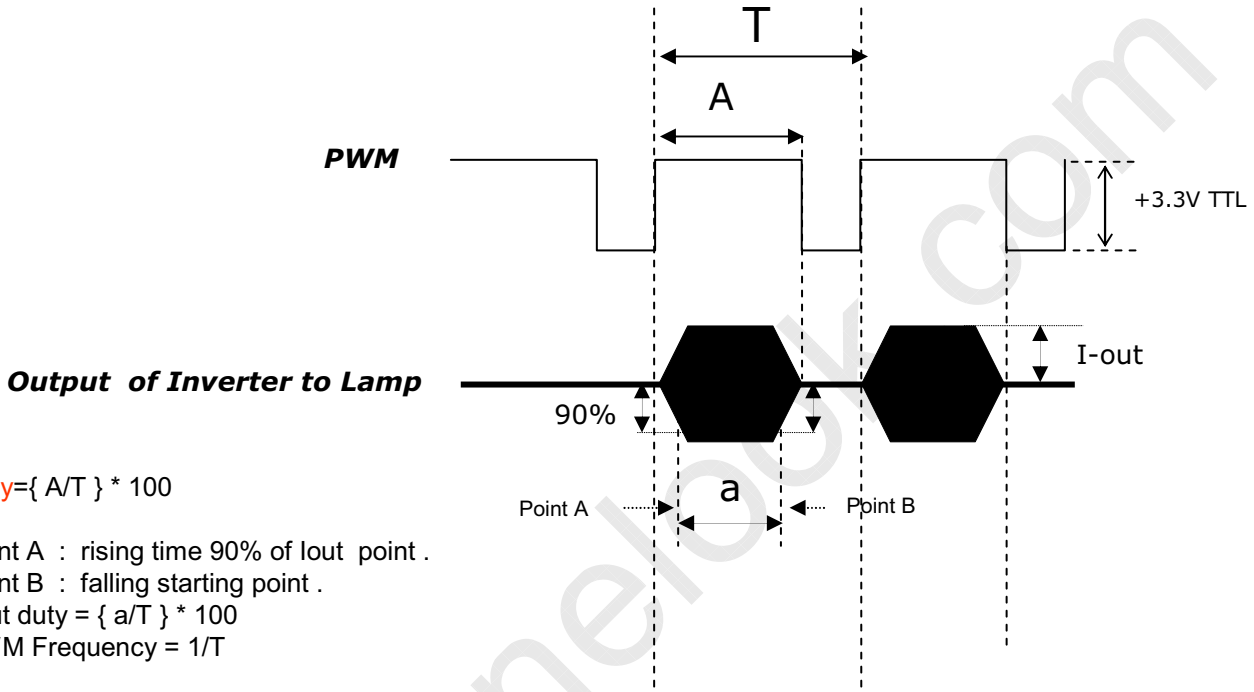
9. The reference method of burst dimming duty ratio.
It is recommended to use synchronous V-sync frequency for prevent waterfall(Vsync x 2 =Burst Frequency)



Duty={ A/T } * 100

Point A : rising time 90% of Iout point .
Point B : falling starting point .
I out duty = { a/T } * 100
PWM Frequency = 1/T

※ We recommend not to be much different between PWM duty and Iout duty .
※ Dimming current output rising and falling time may produce humming and inverter trans' sound noise.
※ Burst dimming duty should be 100% for 1second after turn on
※ Equipment
Oscilloscope :TDS3054B(Tektronix)
Current Probe : P6022 AC (Tektronix)
High Voltage Probe: P5100(Tektronix)

10. The Cable between the backlight connector and its inverter power supply should be connected directly with a minimized length. The longer cable between the backlight and the inverter may cause the lower luminance of lamp and may require more higher starting voltage (Vs).

11. The operating current must be measured as near as backlight assembly input.

12. The operating current unbalance between left and right must be under typ ± 10%.

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3-2. Interface Connections

This LCD employs two kinds of interface connection, a 30-pin connector is used for the module electronics and 14-pin Connector are used for the integral backlight system.

3-2-1. LCD Module

- LCD Connector(CN1) : FI-X30SSL-HF (Manufactured by JAE) or Equivalent
- Mating Connector : FI-X30C2L (Manufactured by JAE) or Equivalent

Table 4. MODULE CONNECTOR(CN1) PIN CONFIGURATION

Pin No.	Symbol	Description	Note
1	V_{LCD}	Power Supply +12.0V	
2	V_{LCD}	Power Supply +12.0V	
3	V_{LCD}	Power Supply +12.0V	
4	V_{LCD}	Power Supply +12.0V	
5	GND	Ground	
6	GND	Ground	
7	GND	Ground	
8	GND	Ground	
9	Select	Select LVDS Data format	1
10	GND	Ground	
11	GND	Ground	
12	RA-	LVDS Receiver Signal(-)	
13	RA+	LVDS Receiver Signal(+)	
14	GND	Ground	
15	RB-	LVDS Receiver Signal(-)	
16	RB+	LVDS Receiver Signal(+)	
17	GND	Ground	
18	RC-	LVDS Receiver Signal(-)	
19	RC+	LVDS Receiver Signal(+)	
20	GND	Ground	
21	RCLK-	LVDS Receiver Clock Signal(-)	
22	RCLK+	LVDS Receiver Clock Signal(+)	
23	GND	Ground	
24	RD-	LVDS Receiver Signal(-)	
25	RD+	LVDS Receiver Signal(+)	
26	GND	Ground	
27	NC	No Connection	
28	NC	No Connection	
29	GND	Ground	
30	GND	Ground	2

Note:

1. The pin no 9 is an option pin for DISM or LG format.(LG Format = “GND”or“OPEN”/ DISM Format =“VCC”)
   Please refer to page 28 ,29 and 30 for further details.
2. The pin no 30 is LCD Test option.
   “AGP” (Auto Generation LCM operates Pattern) or “NSB” (No Signal Black) is case that LVDS signals are out of frequency or abnormal condition in spite of 12 volt power supply.
   LPL recommends “NSB”. (AGP : “VCC” or “OPEN” / NSB : “GND”)
3. All GND pins should be connected together, which should be also connected to the LCD module’s metal frame.
4. All V_{LCD} (power input) pins should be connected together.
5. Input Levels of LVDS signals are based on the EIA 664 Standard.

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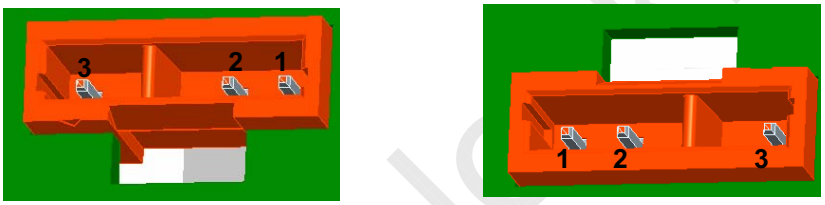
Table 5. BACKLIGHT CONNECTOR PIN CONFIGURATION(CN2,CN3)

The backlight interface connector is a model 65002WS-03(CN2/CN3) manufactured by YEONHO. The mating connector part number are 65002HS-03(3 pin) or equivalent. The pin configuration for the connector is shown in the table below.

No	Symbol	Master	Slave	Note
1	**H_Input**	High_Input	High_Input	
2	**H_Input**	High_Input	High_Input	
3	**FB**	NC	NC	

◆ **Rear view of LCM**



-. Connector : 65002WS-03 (YEONHO) or equivalent
-. Mating Connector : 65002HS-03(YEONHO) or equivalent

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3-3. Signal Timing Specifications

This is the signal timing required at the input of LVDS Transmitter. All of the interface signal timing should be satisfied with the following specifications for it's proper operation.

Table 6. TIMING TABLE for NTSC & PAL

ITEM	Symbol		Min	Typ	Max	Unit	Note
DCLK	Period	t_{CLK}	12.5	13.8	15.8	ns	
	Frequency	-	63	72.4	80	MHz	
Hsync	Period	t_{HT}	1456	1528	1920	t_{CLK}	
	Horizontal Valid	t_{HV}	1366	1366	1366	t_{CLK}	
	Horizontal Blank	-	t_{HP}- t_{HV}	162	t_{HP}- t_{HV}		
	Frequency	f_H	45	47.4	50	KHz	
	Width	t_{WH}	-	32	-	t_{CLK}	
	Horizontal Back Porch	t_{HBP}	24	50	-		
	Horizontal Front Porch	t_{HFP}	40	80	-		
Vsync	Period	t_{VT}	776	790	1063	t_{HP}	Note 1) PAL : 47~53Hz NTSC : 57~63Hz
	Vertical Valid	t_{VV}	768	768	768	t_{HP}	
	Vertical Blank	-	t_{VP}- t_{VV}	22	t_{VP}- t_{VV}	t_{HP}	
	Frequency	f_V	47	60	63	Hz	
	Width	t_{WV}	-	5	-	t_{HP}	
	Vertical Back Porch	t_{VBP}	5	15	-	Hz	
	Vertical Front Porch	t_{VFP}	1	2	-	t_{HP}	

Note :

1. The performance of the electro-optical characteristics may be influenced by variance of the vertical refresh rate.
2. Above Timing Tables are only valid for DE Mode.

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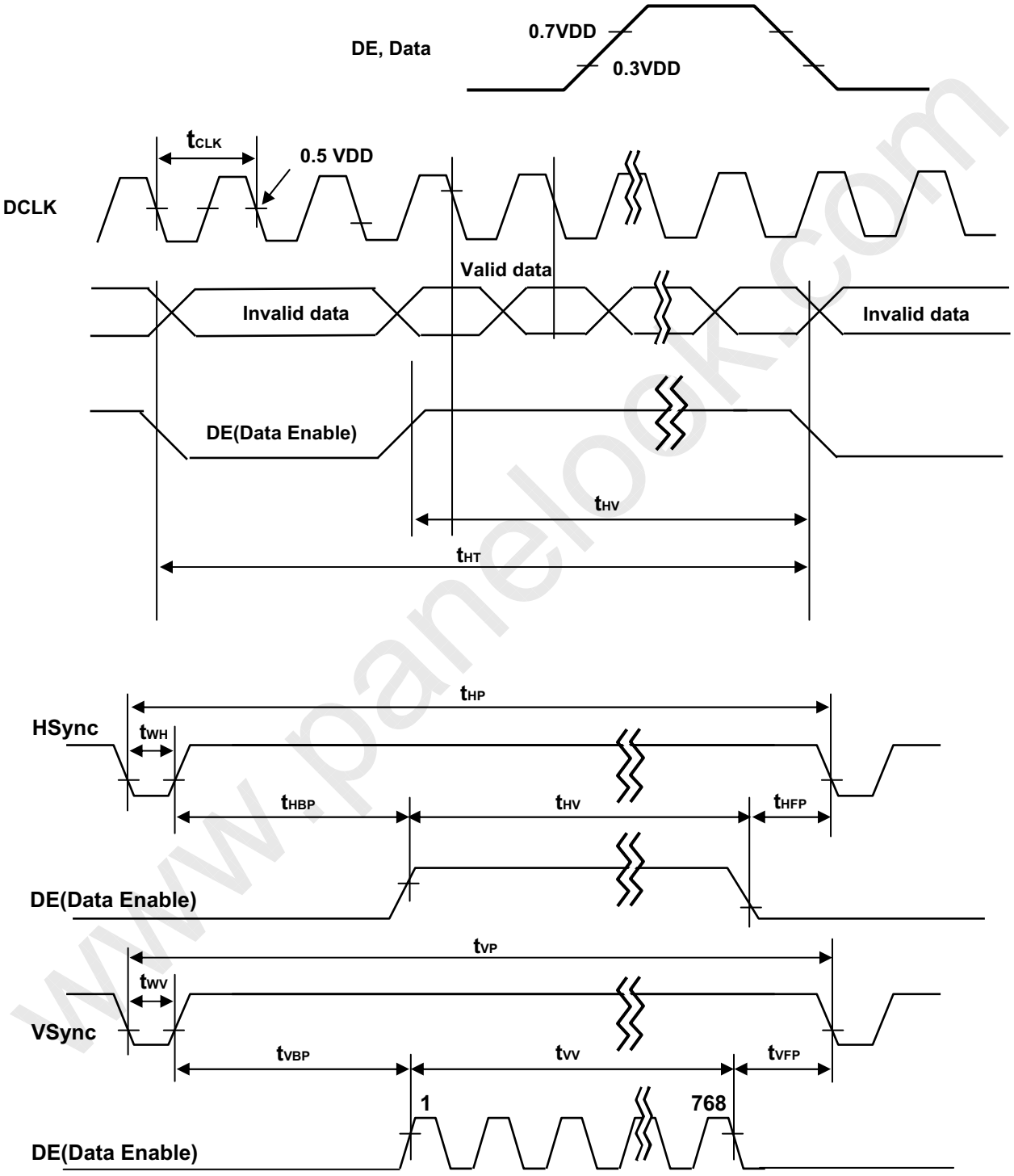
3-4. Signal Timing Waveforms



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3-5. Color Data Reference

The brightness of each primary color(red,green,blue) is based on the 8-bit gray scale data input for the color the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

Table 7. COLOR DATA REFERENCE

Color		Input Color Data																							
		RED								GREEN								BLUE							
		MSB							LSB	MSB							LSB	MSB							LSB
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (001)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	...				...								...								...				
	RED (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	...				...								...								...				
	GREEN (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE (000) Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE (001)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	...				...								...								...				
	BLUE (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

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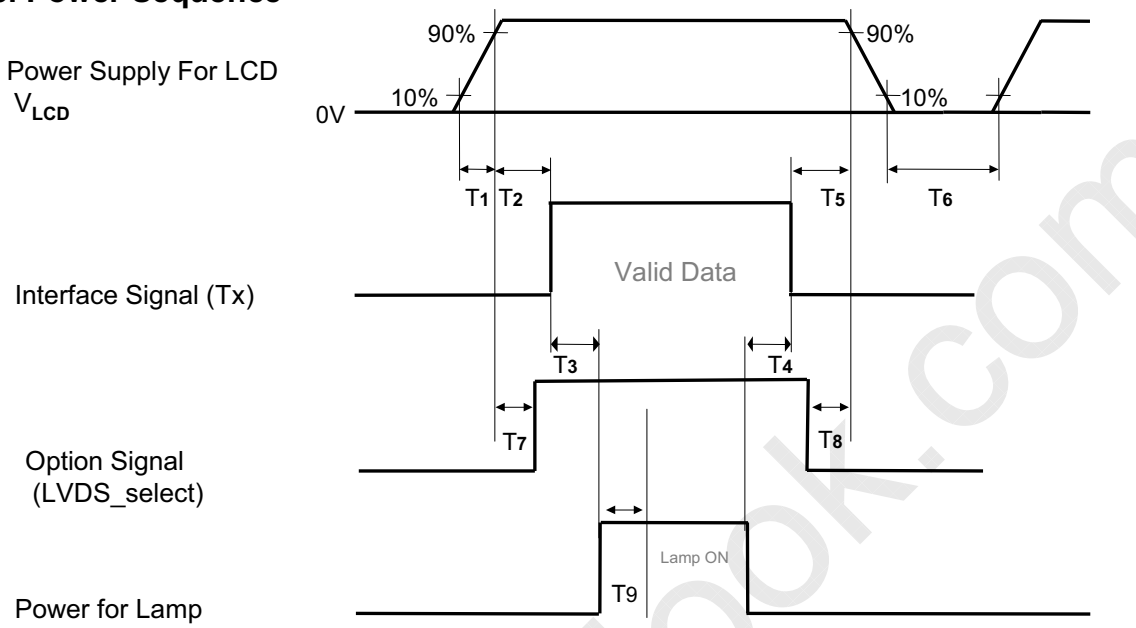
3-6. Power Sequence



*** Burst Dimming Duty : 100% & Iop : Typical Current**

Table 8. POWER SEQUENCE

Parameter	Value			Unit	Notes
	Min	Typ	Max		
T1	0.5	-	20	ms	
T2	0.5	-	3 x (1/f_V)	ms	3,5
T3	200	-	-	ms	4
T4	200	-	-	ms	4
T5	0	-	-	ms	3,5
T6	2.0	-	-	s	2,6
T7	0	-	T2	ms	5
T8	0	-	-	ms	5
T9	1000	-		ms	7

Note : 1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply V_{LCD} to 0V.
3. The case when the T2/T5 exceed 3x(1/fv), it operates protection pattern (Black pattern) till valid signal inputted. There is no reliability problem. (ex. 60Hz : 3x(1/60Hz) = 50ms)
4. The T3/T4 is recommended value, the case when failed to meet a minimum specification, abnormal display would be shown. There is no reliability problem.
5. If the on time of option signal(Interface signal and Option signals) precedes the on time of Power(V_{LCD}), check the LCD logic Power(Vcc) is under 0.8V, otherwise it will be happened abnormal display.
6. T6 should be measured after the Module has been fully discharged between power off and on period.
7. In T9 section, **burst dimming duty** should be duty 100% and **typical current** (Iop)

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4. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable in a dark environment at 25± 2℃. The values specified are at an approximate distance 50cm from the LCD surface at a viewing angle of Φ and θ equal to 0 °.
FIG. 1 shows additional information concerning the measurement equipment and method.

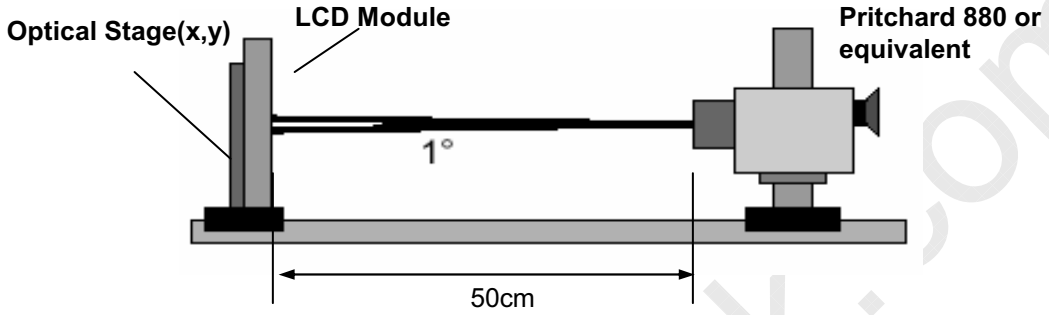

FIG. 1 Optical Characteristic Measurement Equipment and Method

Table 9. OPTICAL CHARACTERISTICS Ta= 25± 2℃, V_{LCD}=12.0V, fv=60Hz, Dclk=72MHz, V_{BR_A} =1.65V V_{BR_B} =3.3V

Parameter		Symbol	Value			Unit	Note
			Min	Typ	Max		
Contrast Ratio		CR	800	1100			1
Surface Luminance, white		L_{WH}	400	500		cd/m^2	2
Luminance Variation		δ_{WHITE} 5P			1.3		3
Response Time	Gray-to-Gray	G to G	-	5	10	ms	4
	Rise + decay	$Tr_R + Tr_D$	-	12	-		
Color Coordinates [CIE1931]	RED	Rx	Typ -0.03	0.636	Typ +0.03		
		Ry		0.335			
	GREEN	Gx		0.284			
		Gy		0.610			
	BLUE	Bx		0.144			
		By		0.063			
	WHITE	Wx		0.279			
		Wy		0.292			
Viewing Angle (CR>10)							
	x axis, right(ϕ=0°)	θr	89	-	-	degree	5
	x axis, left (ϕ=180°)	θl	89	-	-		
	y axis, up (ϕ=90°)	θu	89	-	-		
	y axis, down (ϕ=270°)	θd	89	-	-		
Gray Scale			-	-	-		6

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Notes 1. Contrast Ratio(CR) is defined mathematically as :

CR (Contrast Ratio) = Maximum CRn (n=1, 2, 3, 4, 5)
DCR (Dynamic CR) = Maximum CRn (n=1, 2, 3, 4, 5)

$$CRn = \frac{\text{Surface Luminance at position n with all white pixels}}{\text{Surface Luminance at position n with all black pixels}}$$

n = the Position number(1, 2, 3, 4, 5), For more information, see FIG 2.

2. Surface luminance is luminance value at the center point across the LCD surface 50cm from the surface with all pixels displaying white.
For more information, see FIG 2.

3. The variation in surface luminance , δ WHITE is defined as :
δ WHITE(5P) = Maximum(L_{on1},L_{on2}, L_{on3}, ... , L_{on5}) / Minimum(L_{on1},L_{on2}, L_{on3}, ... , L_{on5})
Where L_{on1} to L_{on5} are the luminance with all pixels displaying white at 5 locations .
For more information, see FIG 2.

4. Response time is the time required for the display to transition from G(N) to G(M) (Rise Time, Tr_R) and from G(M) to G(N) (Decay Time, Tr_D). For additional information see the FIG. 3. (N<M)

5. Viewing angle is the angle at which the contrast ratio is greater than 10. The angles are determined for the horizontal or x axis and the vertical or y axis with respect to the z axis which is normal to the LCD surface. For more information, see FIG 4.

6. Gray scale specification
Gamma Value is approximately 2.2. For more information, see Table 10.

Table 10. GRAY SCALE SPECIFICATION

Gray Level	Luminance [%] (Typ)
L0	0.10
L15	0.32
L31	1.10
L47	2.60
L63	4.90
L79	8.10
L95	12.1
L111	16.7
L127	21.6
L143	28.0
L159	35.4
L175	43.9
L191	53.3
L207	64.1
L223	75.8
L239	88.0
L255	100

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Measuring point for surface luminance & measuring point for luminance variation

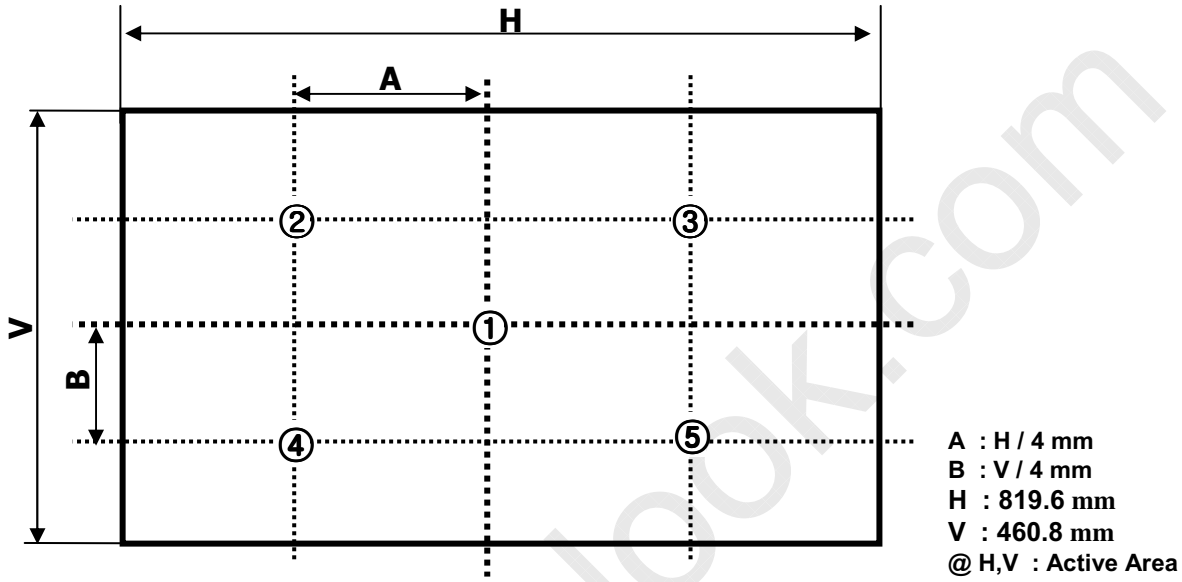

FIG. 2 Measure Point for Luminance

Response time is defined as the following figure and shall be measured by switching the input signal for "Gray(N)" and "Gray(M)".

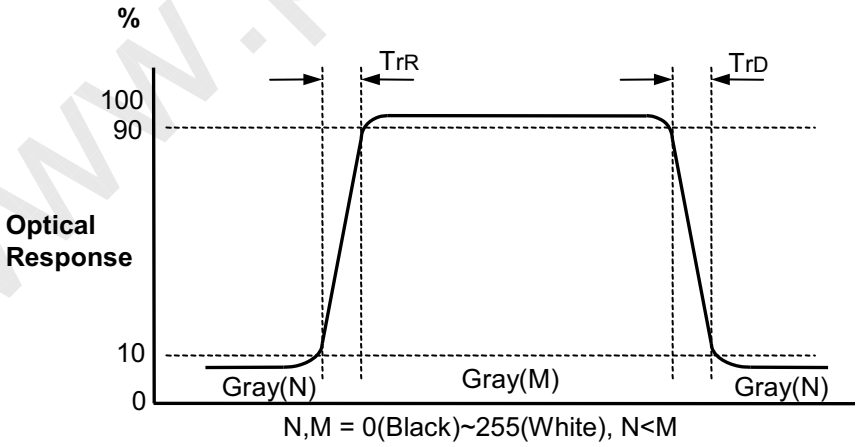

FIG. 3 Response Time

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Dimension of viewing angle range

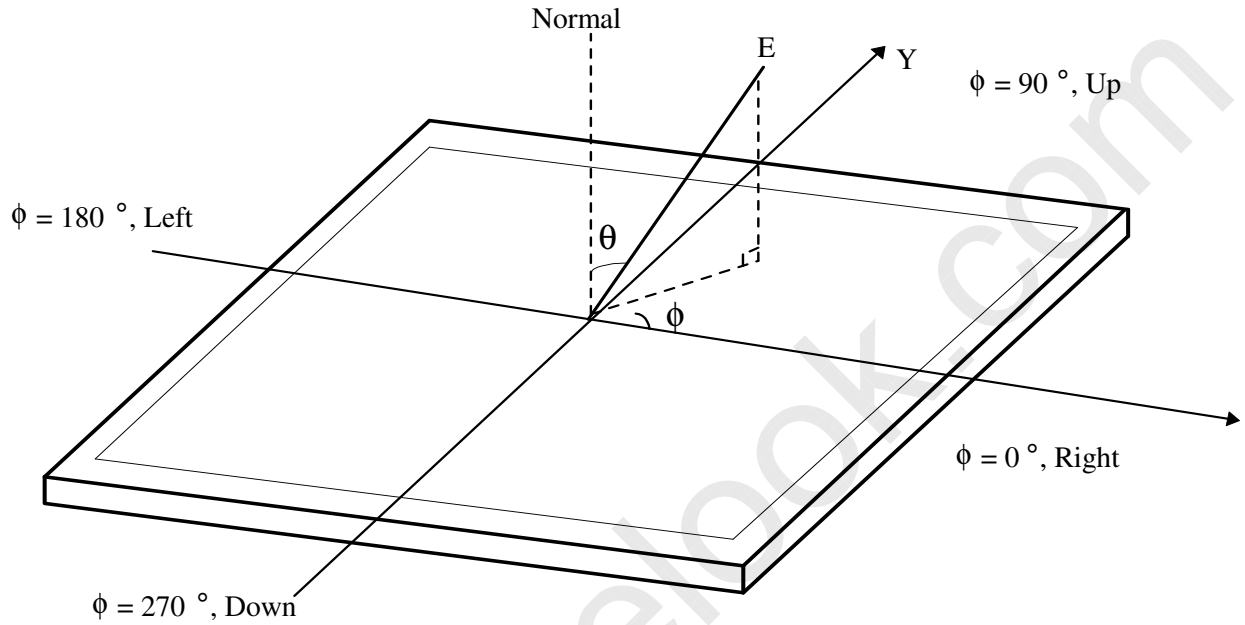

FIG. 4 Viewing angle

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5. Mechanical Characteristics

The following items provide general mechanical characteristics. In addition the figures in the next page are detailed mechanical drawing of the LCD module.

Table 11. MECHANICAL CHARACTERISTICS

Outline Dimension	Horizontal	877.0 mm
	Vertical	516.8 mm
	Depth	46.9 mm
Bezel Area	Horizontal	828.6mm
	Vertical	469.8mm
Active Display Area	Horizontal	819.6mm
	Vertical	460.8mm
Weight	8,700g(Typ.) /9,000g(Max)	
Surface Treatment	Hard coating(3H) Anti-glare treatment of the front polarizer, Haze 13%	

Note : Please refer to a mechanic drawing in terms of tolerance at the next page.

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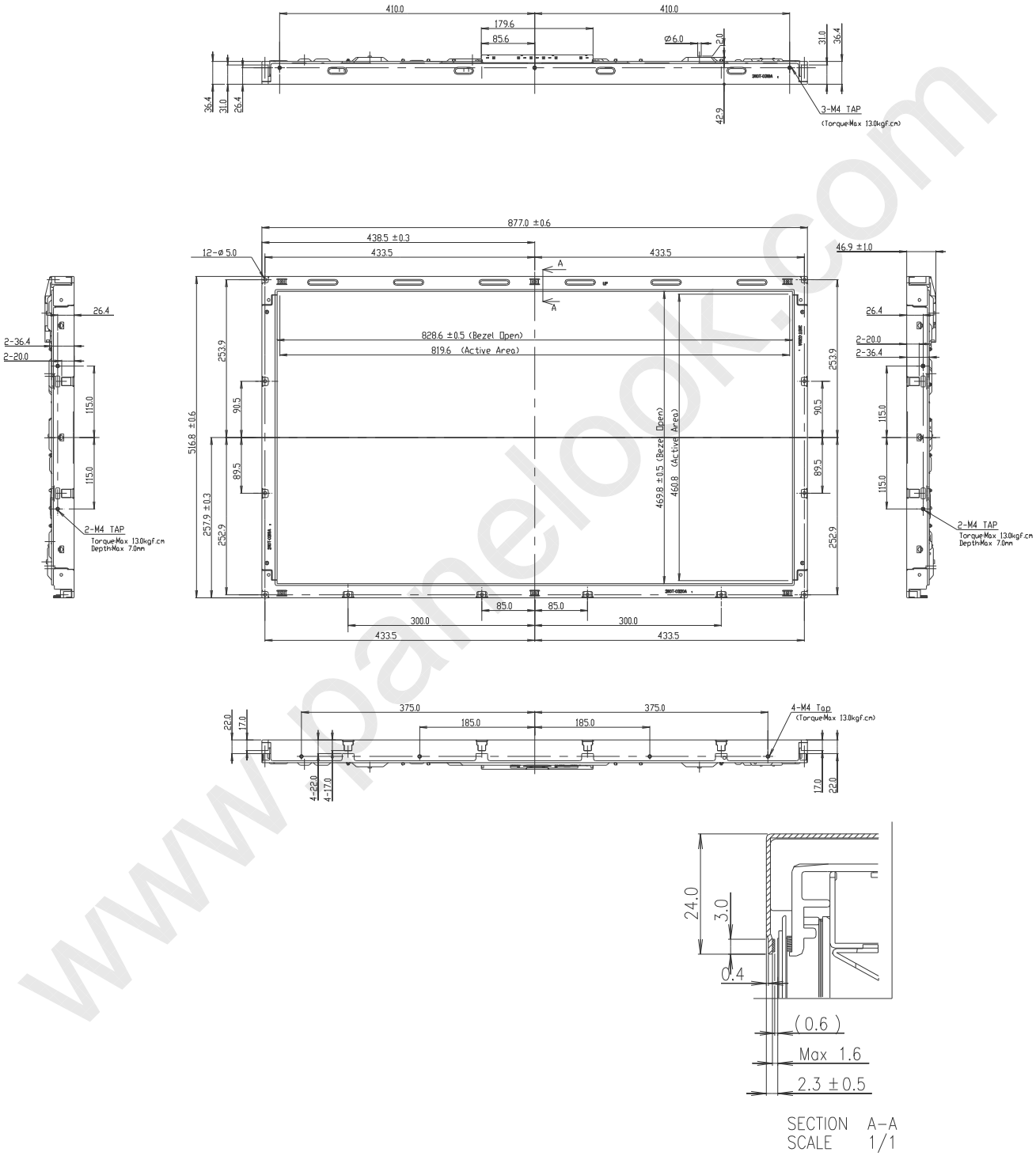
<FRONT VIEW>



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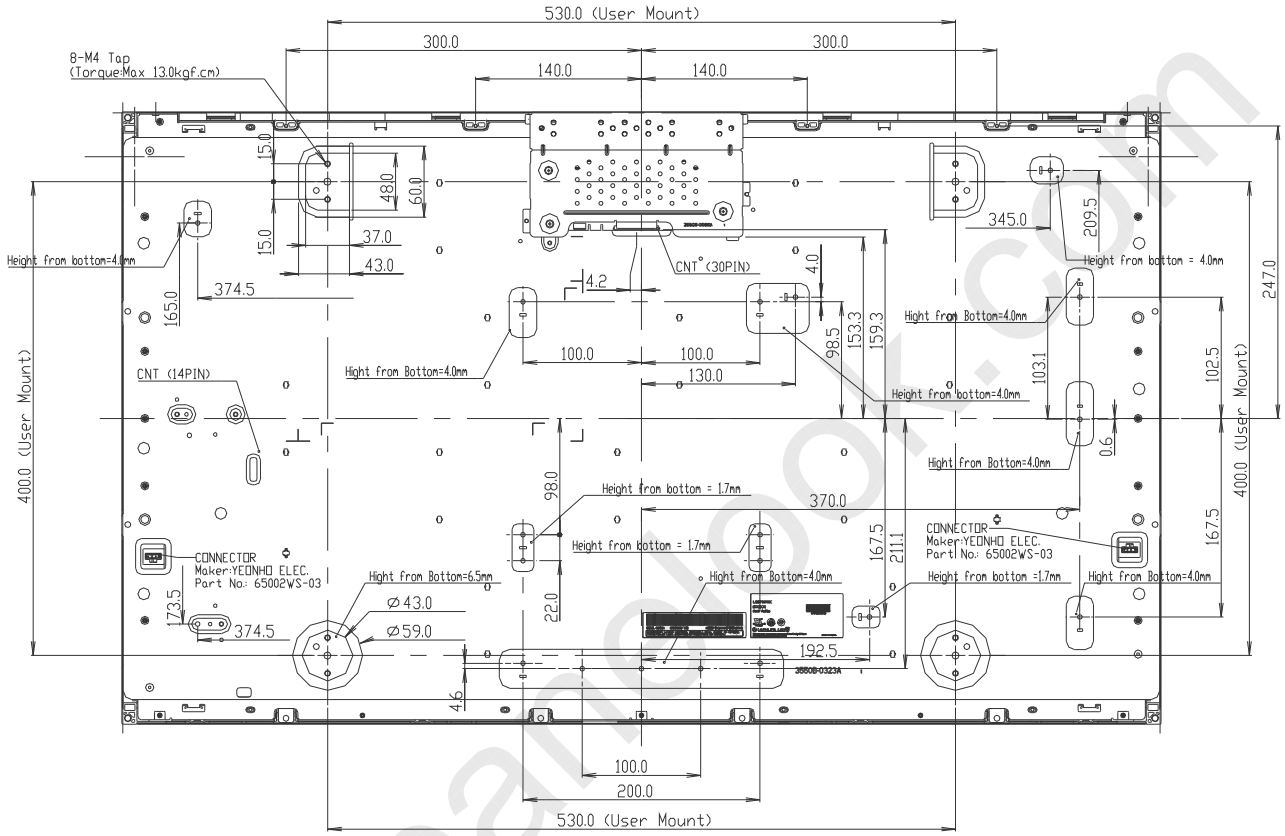
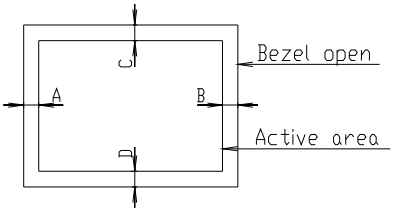
<REAR VIEW>



NOTES
1. Unspecified tolerances are to be ±0.5mm.
2. This drawing is only preliminary data and can be changed without notice.
3. Tilt and partial disposition tolerance of display area is as following.
   (1) X-Direction : IA-BI ≤ 1.5mm
   (2) Y-Direction : IC-DI ≤ 1.5mm



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6. Reliability

Table 12. ENVIRONMENT TEST CONDITION

No.	Test Item	Condition
1	High temperature storage test	Ta=60℃, 75% 240h
2	Low temperature storage test	Ta= -20℃ 240h
3	High temperature operation test	Ta= 50℃ 60%RH 240h
4	Low temperature operation test	Ta= 0℃ 240h
5	Vibration test (non-operating)	Wave form : random Vibration level : 1.0Grms Bandwidth : 10-500Hz Duration : X,Y,Z, 10 min One time each direction
6	Shock test (non-operating)	Shock level : 100Grms Waveform : half sine wave, 2ms Direction : ±X, ±Y, ±Z One time each direction
7	Humidity condition Operation	Ta= 40 ℃, 90%RH
8	Altitude operating storage / shipment	0 - 15,000 ft 0 - 40,000 ft

Note :
1. Before and after Reliability test, LCM should be operated with normal function

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7. International Standards

7-1. Safety

a) UL 60065, 7th Edition, dated June 30, 2003, Underwriters Laboratories, Inc., Standard for Audio, Video and Similar Electronic Apparatus.
b) CAN/CSA C22.2, No. 60065:03, Canadian Standards Association, Standard for Audio, Video and Similar Electronic Apparatus.
c) IEC60065:2001, 7th Edition CB-scheme and EN 60065:2002, Safety requirements for Audio, Video and Similar Electronic Apparatus..

7-2. EMC

a) ANSI C63.4 “Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electrical Equipment in the Range of 9kHZ to 40GHz. “American National Standards Institute(ANSI), 1992
b) CISPR13 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
CISPR22 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" International Special Committee on Radio Interference.
c) EN55013 "Limits and Methods of Measurement of Radio interference characteristics of Sound and Television broadcast receivers and associated equipment"
EN55022 "Limits and Methods of Measurement of Radio interference characteristics of Information Technology Equipment" European Committee for Electro Technical Standardization.(CENELEC), 1988(Including A1:2000)

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8. Packing

8-1. Designation of Lot Mark

a) Lot Mark

A	B	C	D	E	F	G	H	I	J	K	L	M

A,B,C : SIZE(INCH)
E : MONTH

D : YEAR
F ~ M : SERIAL NO.

Note

1. YEAR

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Mark	1	2	3	4	5	6	7	8	9	0

2. MONTH

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mark	1	2	3	4	5	6	7	8	9	A	B	C

b) Location of Lot Mark

Serial No. is printed on the label. The label is attached to the backside of the LCD module.
This is subject to change without prior notice.

8-2. Packing Form

a) Package quantity in one box : 4 pcs

b) Box Size : 968mm X 366mm X 595mm

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9. Precautions

Please pay attention to the followings when you use this TFT LCD module.

9-1. Mounting Precautions

(1) You must mount a module using holes arranged in four corners or four sides.
(2) You should consider the mounting structure so that uneven force (ex. Twisted stress) is not applied to the module. And the case on which a module is mounted should have sufficient strength so that external force is not transmitted directly to the module.
(3) Please attach the surface transparent protective plate to the surface in order to protect the polarizer. Transparent protective plate should have sufficient strength in order to the resist external force.
(4) You should adopt radiation structure to satisfy the temperature specification.
(5) Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the polarizer at high temperature and the latter causes circuit break by electro-chemical reaction.
(6) Do not touch, push or rub the exposed polarizers with glass, tweezers or anything harder than HB pencil lead. And please do not rub with dust clothes with chemical treatment.
Do not touch the surface of polarizer for bare hand or greasy cloth.(Some cosmetics are detrimental to the polarizer.)
(7) When the surface becomes dusty, please wipe gently with absorbent cotton or other soft materials like chamois soaks with petroleum benzine. Normal-hexane is recommended for cleaning the adhesives used to attach front / rear polarizers. Do not use acetone, toluene and alcohol because they cause chemical damage to the polarizer.
(8) Wipe off saliva or water drops as soon as possible. Their long time contact with polarizer causes deformations and color fading.
(9) Do not open the case because inside circuits do not have sufficient strength.

9-2. Operating Precautions

(1) The spike noise causes the mis-operation of circuits. It should be lower than following voltage :
V=± 200mV(Over and under shoot voltage)
(2) Response time depends on the temperature.(In lower temperature, it becomes longer.)
(3) Brightness depends on the temperature. (In lower temperature, it becomes lower.)
And in lower temperature, response time(required time that brightness is stable after turned on) becomes longer
(4) Be careful for condensation at sudden temperature change.Condensation makes damage to polarizer or electrical contacted parts. And after fading condensation, smear or spot will occur.
(5) When fixed patterns are displayed for a long time, remnant image is likely to occur.
(6) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference shall be done by system manufacturers. Grounding and shielding methods may be important to minimized the interference.
(7) Please do not give any mechanical and/or acoustical impact to LCM. Otherwise, LCM can't be operated its full characteristics perfectly.
(8) A screw which is fastened up the steels should be a machine screw.
(if not, it can causes conductive particles and deal LCM a fatal blow)
(9) Please do not set LCD on its edge.
(10) It is recommended to avoid the signal cable and conductive material over the inverter transformer for it can cause the abnormal display and temperature rising.

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9-3. Electrostatic Discharge Control

Since a module is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc. And don't touch interface pin directly.

9-4. Precautions for Strong Light Exposure

Strong light exposure causes degradation of polarizer and color filter.

9-5. Storage

When storing modules as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The polarizer surface should not come in contact with any other object.
It is recommended that they be stored in the container in which they were shipped.

9-6. Handling Precautions for Protection Film

(1) The protection film is attached to the bezel with a small masking tape.
When the protection film is peeled off, static electricity is generated between the film and polarizer.
This should be peeled off slowly and carefully by people who are electrically grounded and with well ion-blown equipment or in such a condition, etc.
(2) When the module with protection film attached is stored for a long time, sometimes there remains a very small amount of glue still on the bezel after the protection film is peeled off.
(3) You can remove the glue easily. When the glue remains on the bezel surface or its vestige is recognized, please wipe them off with absorbent cotton waste or other soft material like chamois soaked with normal-hexane.

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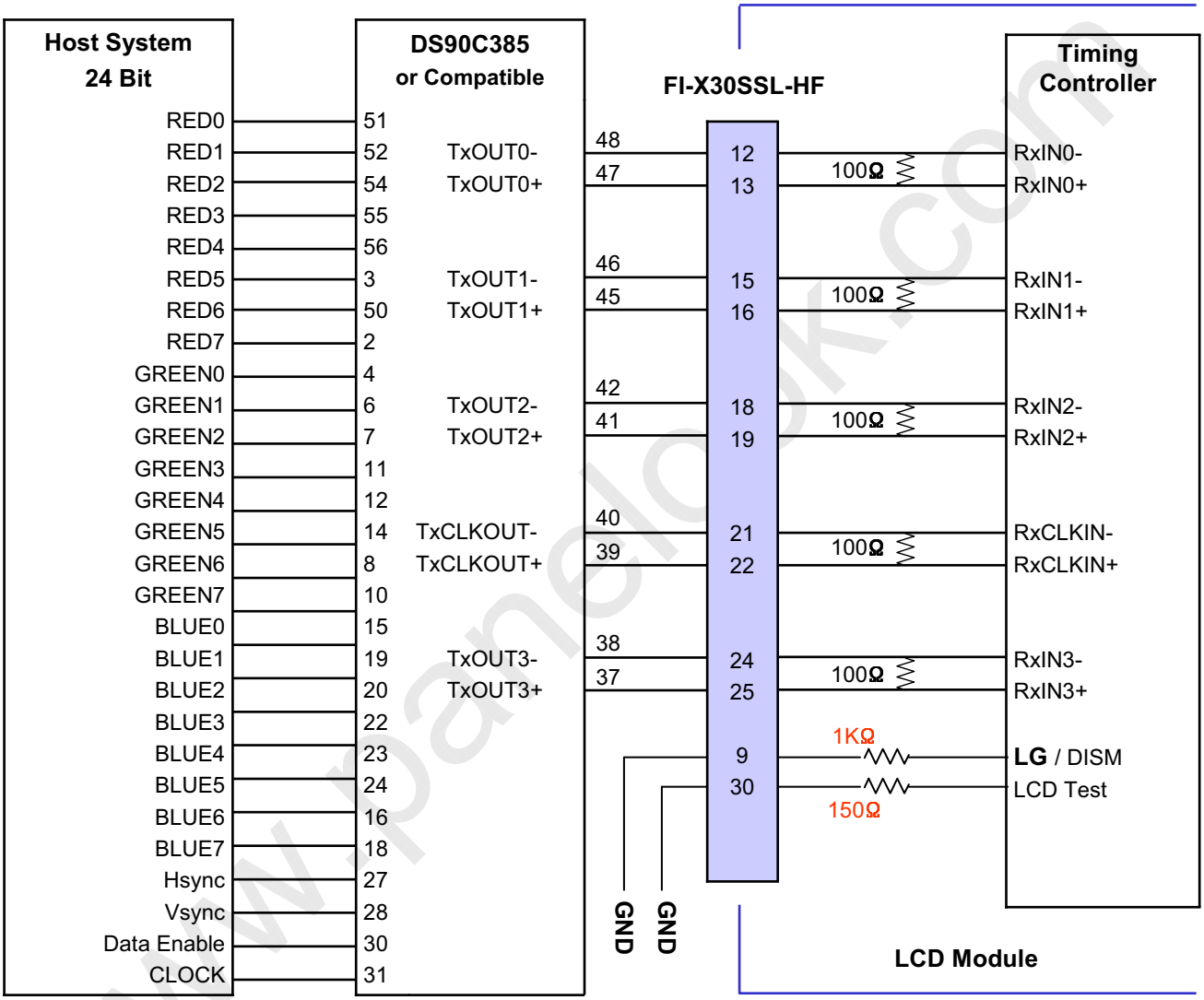
Appendix 1-1.

■ REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="L")



Note: 1. The LCD Module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.

2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)

3. '7' means MSB and '0' means LSB at R,G,B pixel data.

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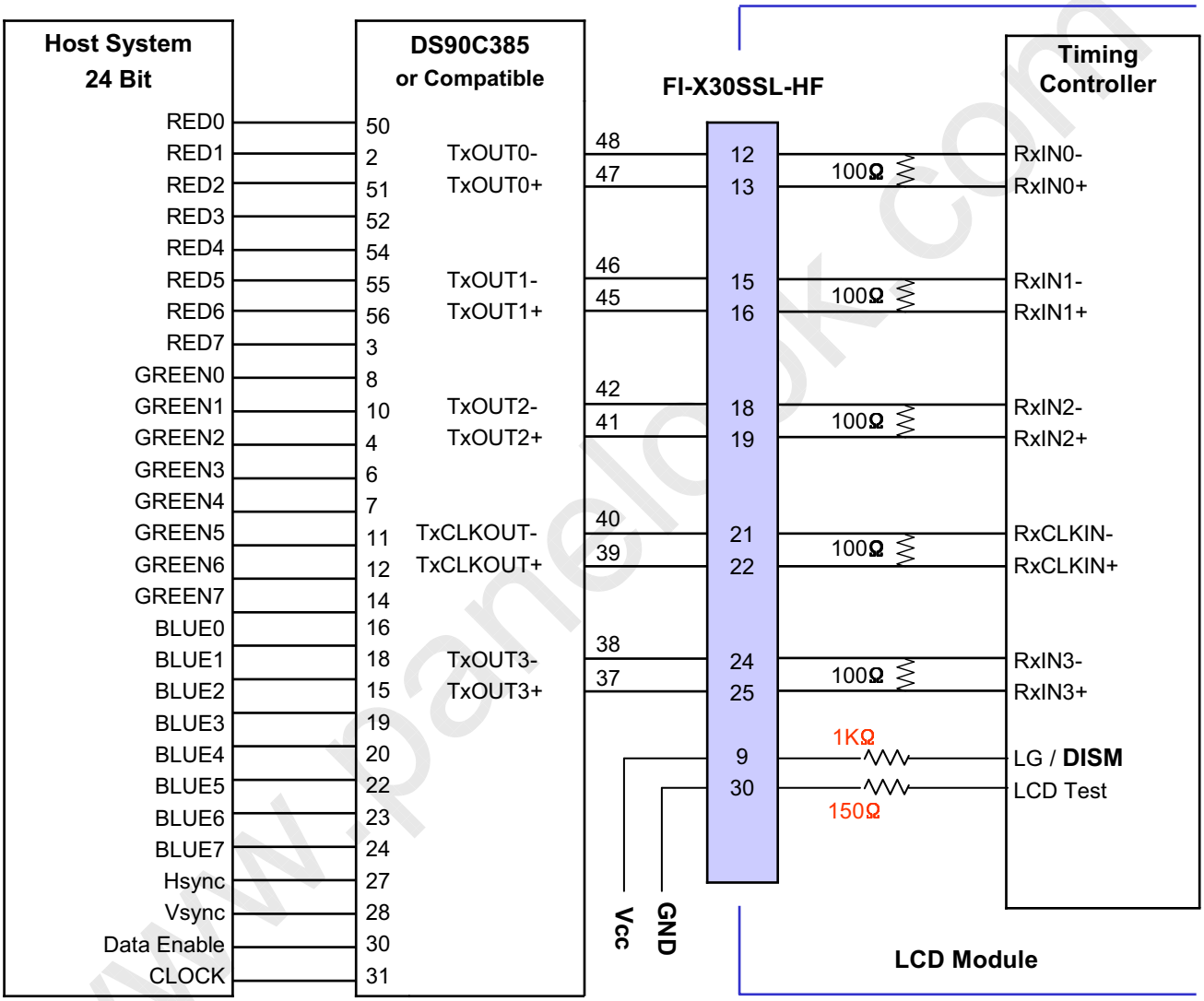
Appendix 1-2.

■ **REQUIRED SIGNAL ASSIGNMENT FOR LVDS TRANSMITTER (Pin9="H")**



Note: 1. The LCD Module uses a 100 Ohm[Ω] resistor between positive and negative lines of each receiver input.
2. Refer to LVDS Transmitter Data Sheet for detail descriptions. (DS90C385 or Compatible)
3. '7' means MSB and '0' means LSB at R,G,B pixel data.

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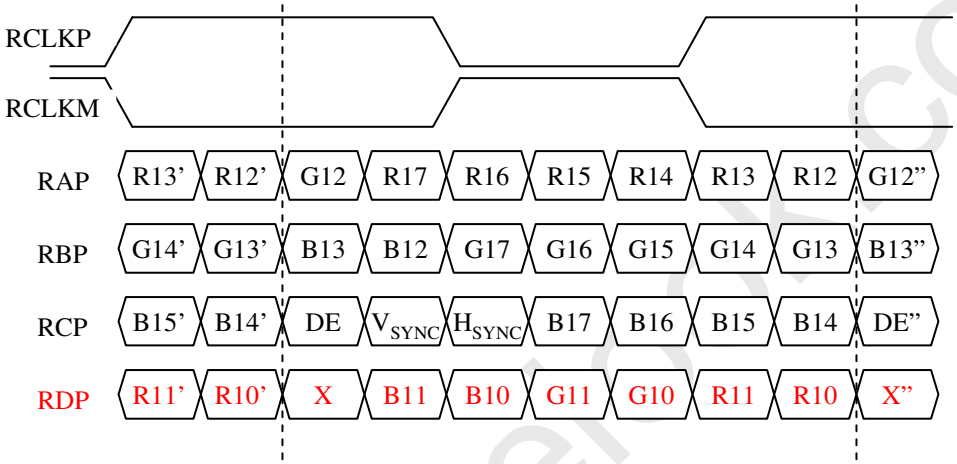
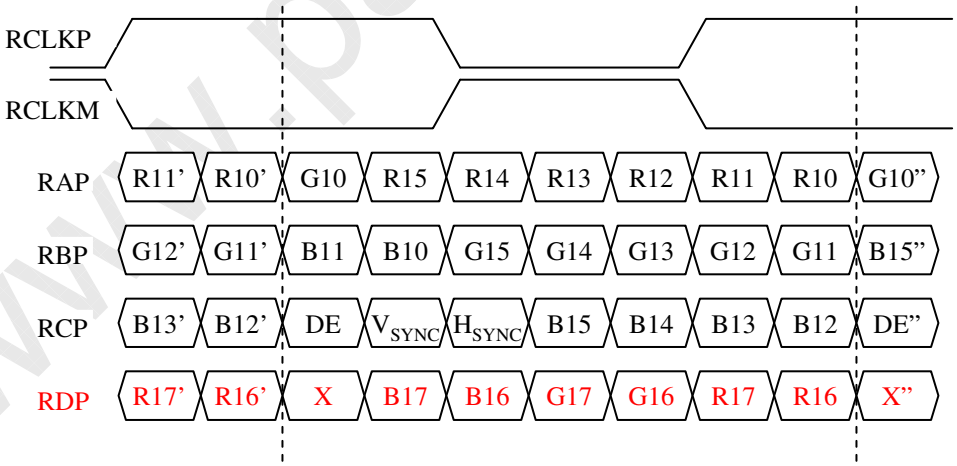
Appendix 1-3.

LVDS Data-Mapping info. (8bit)

■ LVDS Select : "H" Data-Mapping (JEIDA format)



■ LVDS Select : "L" Data-Mapping (LG format)



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Appendix 2-1 Option Pin Circuit Block Diagram

The figure of the option pin Circuit Block Diagram

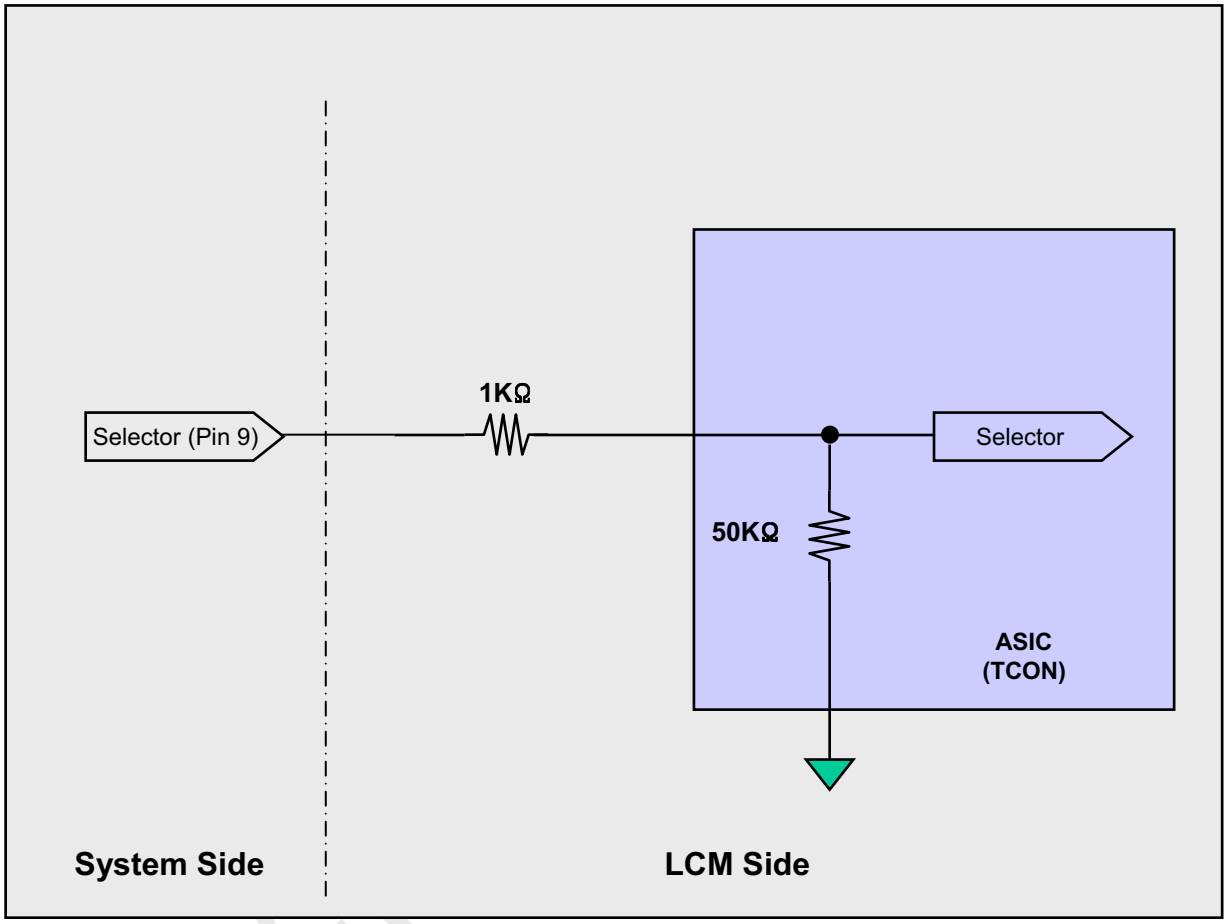

Fig.5 The Selector Pin Circuit Block Diagram

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